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REMARKS

Claim 8 has been cancelled without prejudice or disclaimer, claims 4-7 and 9-14 were previously amended, claims 1-3 are currently amended, claims 15 and 16 were previously presented, and new claim 17 has been added. Thus, claims 1-7 and 9-17 remain pending and are submitted for reconsideration. No new matter has been added.

The drawings were objected to under 37 C.F.R. § 1.83(a) for allegedly failing to show the features of claim 8. This objection is respectfully submitted to be moot in view of the cancellation, without prejudice or disclaimer, of claim 8.

Claims 1, 3-7 and 9-14 stand rejected under 35 U.S.C. § 103(b) as allegedly being anticipated by U.S. Patent 2,930,404 to Kowalski et al. (Kowalski). Claims 1-4, 6, 11, 12, 15 and 16 stand rejected under 35 U.S.C. § 103(b) as allegedly being anticipated by U.S. Patent 5,476,079 to Kanamori et al. (Kanamori). And claims 2 and 8 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kowalski. These rejections are respectfully traversed in view of the following comments.

The subject of the application involves a two-way proportional pressure valve as can readily be seen from the example of embodiment described and illustrated. The solenoid valve according to Kowalski is a three-way poppet valve. The solenoid valve according to Kanamori is a two-way poppet valve. There are therefore fundamental differences in the basic operation of Applicants' valve versus the valves of the applied prior art.

Between Applicants' invention and Kowalski there are at least eight differences, which will now be described in greater detail.

First, Kowalski appears to show a solenoid valve that has expensive hydraulics with two tank connections 30 and 70. In the hydraulic part there is also a mechanical stop 56 and an auxiliary spring 106 that forces tappet 54 toward a disengagement and open position. Kowalski's solenoid valve, along with compression spring 106, there is also a compression spring 142 with which the flat armature 124 is tensioned. This makes this solenoid valve expensive to construct and also makes its installation expensive. In contrast, Applicants' solenoid valve 28 is provided in the form of a ball as a hydraulic closing element. The entire solenoid valve has only the one spring 40 which forces tappet 36 toward the closed position via

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flat armature 38. Since there is only one spring, installation and adjustment of this solenoid valve is very simple.

Second, in the solenoid valve according to the Kowalski, the flat armature rests firmly axially on plunger 126 that is configured in the form of a threaded bushing that accepts screw 130. Plunger 126 is separate from tappet 54. Plunger 126 with screw 130 is held tightly against tappet 54 by the force of compression spring 142. Kowalski appears to show two units separated from each other (flat armature 124, plunger 126, screw 130 and tappet 54), which are held together by spring pressure. This separation of the two units makes installation of the solenoid valve more difficult and more expensive. In contrast, Applicants' flat armature 38 rests firmly axially right on tappet 36, with which valve body 28 is pressed into its valve seat 34. Flat armature 38 with tappet 36 therefore forms a one-piece structural element.

Third, Kowalski appears to show that tappet 54 is firmly connected to valve body 57,86. In contrast, Applicants' valve body 28 and tappet 36 are separate components.

Fourth, the solenoid valve of the Kowalski appears to show the flat armature 124 resting on plunger 126 and into which screw 130 is screwed. On it rests locknut 132 with which the set position of screw 130 relative to plunger 126 and flat armature 124 can be locked. In contrast, Applicants' conditions are completely different: a press fit joins flat armature 38 and tappet 36. The two parts can thereby be moved relative to each other when the solenoid valve is installed and can be optimally adjusted. Only then is the solid connection between flat armature 38 and tappet 36 made by flange 44 at the right end of tappet 36, as shown in Applicants' Figure 1. Accordingly, Applicants' design is much simpler than that of Kowalski.

Fifth, Kowalski's solenoid valve has the solid ball 57,86 at the lower end of tappet 54. The valve seat therefore has a right-angled design. In contrast, Applicants' valve body 28 is a separate component from tappet 36, and valve seat 34 therefore has a ball-shaped design.

Sixth, Kowalski's Figure 4 shows that the plunger 126 projects into hole 128 of pole core 43. It is respectfully submitted that Kowalski fails to teach or suggest that pressure equalization takes place between two spaces on the two sides of pole core 43, i.e., via hole 128. In column 3, lines 67-71, and column 3, line 73, to column 4, line 4, Kowalski states, in reference to the adjustment process, that screw 130 is adjusted to such a position that flat armature 124 rests against the face of pole core 43 if valve element 54 is held against valve seat 34 by the required

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compression pressure. Due to the contact of flat armature 124 with the face of pole core 43, metal-to-metal contact is made which limits the movement of the valve element against valve seat 34. Thus, the flat armature 124 rests on pole core 43 if the valve is closed. In contrast, Applicants' flat armature 38 is at a distance from pole core 21 if valve body 28 is in its closed position. This constitutes another difference with respect to Kowalski. Moreover, Applicants' equalization connection between space 30 and armature space 56 is created by the fact that tappet 36 has flattened areas 58 at its two ends and that annular space 60 is provided between the two flattened areas.

Seventh, Kowalski appears to show flat armature 124 resting on plunger 126, and being guided via the annular gap between plunger 126 and pole core 43. It is respectfully submitted that Kowalski's plunger 126 can "tilt" in hole 128 of pole core 43, i.e., the gap between the wall of hole 128 and plunger 126 does not remain equally round. This gap cannot, however, be made as large as one wishes in order to prevent the effects of temperature. If this gap becomes larger, there is the danger that plunger 126 may tilt and jam in hole 128. The characteristic line of the valve would thereby wander or hook. Although this may not be harmful for Kowalski's poppet valve, it would have serious consequences for Applicants' solenoid valve, which is a proportional pressure valve.

If tappet 36 were to tilt in the hole of pole core 21, the proportional valve would have too large a hysteresis. Tappet 36 is therefore guided via the flattened areas 58 in the hole of pole core 21. This gives a constantly equal defined gap between tappet 36 and the wall of the pole core hole. The flattened areas 58 only extend over a short part of the length of tappet 36, as can be seen from Fig. 1 and as described on page 6, lines 20-24 (i.e., the flattened areas 58 are provided at the end sections of tappet 36). These correspondingly short flat areas acts like chokes, and are therefore temperature-independent. Annular gap 60 between the two flattened areas 58 can therefore be made large enough to prevent the effect of temperature. The effect of temperature for attenuating armature space 56 via the pressure equalization between the two faces of pole core 21 is necessary for a clean, temperature-independent pressure characteristic at high and low temperatures. Without these steps, the solenoid valve would, for example, be prone to fluctuations at high temperature but not at low temperature.

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Eighth, Kowalski's flat armature 124 extends over the full radial width of pole core 43 and therefore of winding 120 which is located in pole core 43. Thus, there is no intermediate pole core, as is provided in the form of pole disk 48 according to Applicants' invention. Applicants' intermediate pole core 48 leads to linearization of the characteristic of the pressure proportional valve. Flat armature 38 overlaps pole disk 48 in a certain relationship for the linearization and exact gradient setting of the solenoid current characteristic. The lack of pole disk 48 is another difference between Applicants' invention and Kowalski.

Between Applicants' invention and Kanamori there are at least four differences, which will now be described in greater detail.

First, as in Kowalski, Kanamori's solenoid valve includes a solenoid part in the form of flat armature 43 and plunger 41 that is separate from valve part 34,36. Several springs are also provided in Kanamori's valve. Thus, flat armature 43 is tensioned by compression spring 61; valve needle 36 is held tightly against plunger 41 by compression spring 37; and cylinder 34 is also forced by another compression spring 35 in the direction of the closed position. In contrast, according to Applicants' invention, there is no separation between the solenoid part and the hydraulic part. Flat armature 38 sits firmly on tappet 36 that, with its end, pretensions valve body 38 toward the valve seat 34.

Second as in Kowalski, Kanamori's ball is provided on the movable tappet as a valve body to which a solid rectangular seat is assigned. In contrast, according to Applicants' invention, separate valve body 28 works together with a spherical valve seat 34.

Third, Kanamori's flat armature overlaps the entire winding 44, similarly to Kowalski. Thus, Kanamori suffers from the same disadvantages as Kowalski. In particular, since Kanamori's solenoid valve has no pole core, the defined overlap between the flat armature and the pole core as provided according to Applicants' invention is neither taught nor suggested by Kanamori. Another disadvantage of Kanamori is that plug contacts 47 lead through flat armature 43. This is in contrast to Applicants' invention in which plug contacts 16 are led past flat armature 38 so that there is no friction and so as to avoid increasing hysteresis. Friction and increased hysteresis would, in a proportional pressure valve according to Applicants' invention lead to great disadvantages, e.g., disadvantageous friction. Further, it is noted that Kowalski's

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lines 122, which connect winding 120 with the plug contacts, are also led through flat armature 124, and Kowalski also suffers from this same disadvantage as does Kanamori.

Fourth, Kanamori's pole core 40 is axially pierced by a hole 40a, which connects the two spaces in front of the faces of pole core 40. The thin hole 40a that can be seen in Kanamori's Figure 1 is temperature-dependent, which would be unacceptable for a proportional valve such as that of the Applicants. Such a thin hole in a proportional valve would lead to a different attenuation of the armature space at different temperatures such that fluctuations would occur and the required valve pressure characteristics would not be respected. In contrast, Applicants' connection between space 30 and armature space 56 is achieved via the flattened areas 58 at the two ends of tappet 36 and the annular gap in the area between the flattened areas between tappet 36 and the wall of the hole in pole core 21. The advantages connected with this feature have been described above with reference to Kowalski.

In conclusion, it is respectfully submitted that Kowalski and Kanamori fail to teach or suggest Applicants' invention as a whole, as recited in Applicants' independent claim 1, and that the rejections of this claim should be withdrawn.

Claims 3-7 and 9-14 depend, either directly or indirectly, from Applicant's independent claim 1, and it is respectfully submitted that these dependent claims are also allowable in that they recite the same allowable combinations of features as claim 1, as well as reciting additional features that further distinguish over the applied prior art.

With regard to Applicants' claim 3, it is respectfully submitted that neither Kowalski nor Kanamori teach or suggest that flat armature 38 overlaps a pole disk 48 which is arranged between the part of coil body 10 encompassing winding 12 and the flat armature 38.

With regard to Applicants' claim 2, which has been rewritten in independent form, it is clear that the pressure equalization to both sides of pole core 21 is supplied via T pressure, and that space 30 is connected with tank connection T. Thus, it is respectfully submitted that independent claim 2, and claims 15 and 16 that depend therefrom, are also allowable over the applied prior art for at least the same reasons as Applicants' claim 1.

New claim 17 recites a combination of features that also are respectfully submitted to be allowable over Kowalski and Kanamori. In particular, the Applicants' solenoid includes a flat armature 38 and a tappet 36 that are carried in such a way that it cannot easily tilt in the hole in

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pole core 21. This is achieved by guiding tappet 36 via the flattened areas 58 and a defined gap to the hole in pole core 21. Tappet 36 does not therefore easily tilt and hysteresis can therefore be kept very small.

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CONCLUSION

It is respectfully submitted that the application is now in condition for allowance and an early notification of such is earnestly solicited. Should the Examiner feel that there are any issues outstanding after consideration of this reply, the Examiner is invited to contact Applicant's undersigned representative to expedite the prosecution.

EXCEPT for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment to Deposit Account No. 50-0310. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Respectfully submitted,
MORGAN, LEWIS & BOCKIUS LLP

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By: Scott J. Anchell
Scott J. Anchell
Reg. No. 35,035

Customer No.: 009629
MORGAN, LEWIS & BOCKIUS LLP
1111 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
Tel. 202.739.3000
Fax. 202.739.3001

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